

Acute Urinary Tract Complications Following General Surgical Procedures

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SUMMARY

The most frequent postoperative urinary problem after various types of general operations is urinary retention. It may be due to previously unrecognized dynamic obstruction, but is more often psychogenic or due to a temporary disturbance in function of the sympathetic and parasympathetic nervous systems. Catheterization may be done safely as a means of preventing over-distention of the bladder.

Irritative postoperative lesions are usually due to trigonitis, cystitis or pyelitis. The immediate trauma of pelvic operation is sometimes followed by infection. Careful study will reveal the cause and the type of infection and will give an indication for proper treatment.

Anuria may be the result of postoperative shock, chemical injury of the kidneys or block of the urinary channels by crystals, detritus, edema, or operative accident. A careful, immediate analysis of the problem is imperative. Fluid intake in anuria must not be pushed to the point of edema.

Accidental surgical blocking or severance of a ureter usually may be repaired without difficulty following a period of recovery to permit subsidence of the acute tissue reaction caused by urinary extravasation.

URINARY tract complications arising subsequent to general surgical procedures range in importance from simple urinary retention in the bladder, which may be psychologic in origin, to grave anuria.

DIFFICULTY IN VOIDING

The troublesome complication of difficulty in voiding which may follow almost any surgical procedure requiring that the patient be kept in bed, is often easily overcome by applying simple psychologic aids. Its incidence appears to have some relationship to the type, depth and length of anesthesia and, of course, to the type of operation. About 17 per cent of general surgical patients have to be catheterized postoperatively.

In most cases the problem is one of simple reflex spasm. The patient's fear of doing anything which may cause pain after operation acts to inhibit the parasympathetic nerves and to sensitize the sympathetic nerves. The lower urinary tract nerve supply is widespread. The parasympathetics arise from the second and third sacral segments, the sympathetics from the second thoracic to the fourth lumbar segments.

Surgical irritation of the sympathetics stimulates them to override the parasympathetic impulses, producing increased sphincter tension and a relaxed bladder, with retention resulting. Retention may result from pure detrusor muscle paralysis caused by parasympathetic denervation by surgical injury or section of the nerves. A mild form of bladder paralysis occurs as a result of this type of interference in a large number of patients. It is readily recognizable cystometrically in the first week following operation. Of rarer occurrence is a severe form of paralysis necessitating prolonged treatment by tidal drainage. Mild forms of detrusor paralysis may result in severe retention when there are pre-existing obstructive lesions such as bladder neck obstruction or urethral strictures. Following resection of the rectum, urinary retention is very frequent, due to division of the autonomic nerves, which are, however, in time regenerated. Overdistention in the bladder during this period must be avoided. Undue stretching of the bladder by overdistention may injure the neuromuscular mechanism of the organ to such an extent that recovery of its expulsive power may be difficult and prolonged.

Postoperative urinary infections are sometimes attributed to catheterization after operation, and for this reason emptying of the bladder by catheter is often delayed in the hope that the patient will ultimately void. To be sure, careful aseptic precautions should be observed in catheterization, but in reality it is difficult to induce urinary tract infection by catheterization of the urethra in the patient whose urinary tract is normal. It is much more probable that urinary tract infections which often follow a postoperative period of inability to void are due to overstretching of the bladder with consequent reduction of its normal resistance to bacterial invasion. The size of the catheter, especially in the male, should fit the external urinary meatus. Very small catheters may not readily follow the course of the urethra. Encountering normal urethral folds in their passage through the canal, catheters of small calibre double up, giving the impression of meeting an obstruction. A catheter of proper size causes no

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more discomfort than does a small one and it presses out such folds as it advances through the urethral channel. Lubrication should be generous. Ample lubrication is the secret of successful, comfortable catheterization of the urethra. In the female, the easily directed glass catheter is the most useful instrument for catheterization. Gentleness in handling all instruments is required. Force should never be used in passing a catheter.

INFECTIONS OF THE URINARY TRACT

Infections of the urinary tract which follow general surgical procedures usually indicate the presence of a preexisting urinary tract lesion. When the acute stage of the infection has subsided, a careful search should be made for the underlying cause. It is important to identify the invading organism in order to use the antibiotic or urinary antiseptic most likely to eradicate it. Yet, from a practical standpoint, since antibiotics are known to reinforce one another to such a degree that the effectiveness of most of them in combination is much greater than the sum of each used independently, it is quite proper to launch the attack against the bacterial invader with a combination of sulfone urinary antiseptics plus one or more of the antibiotics, using the combination at once, even before the result of the culture is known. Since many individuals are sensitive to these substances, patients given them must be observed carefully so that the drug may be stopped immediately if evidence of unfavorable reaction arises.

In the female, even though the urine is not infected, bladder distress frequently follows pelvic operations. Immediate cystoscopic examination, when carried out in such cases, reveals edema of and hemorrhage into the base of the bladder, clearly visible on the bladder side of the membrane. Despite the bruising of this area entailed in extensive pelvic dissections, pain in the bladder following pelvic operations is relatively and rather surprisingly rare. With the performance of increasing numbers of panhysterectomies the incidence of postoperative urinary infections and painful trigonitis is rising. Patients in whom this procedure has been carried out seem to have trouble in the second and third week following operation rather than during the immediate postoperative period. In its natural state the vaginal vault harbors many bacteria. Per primum healing here must be rare. Healing must take place by secondary intention as the rule. It would be surprising if the inflammatory reaction accompanying healing in this area did not extend across the thin vaginal septum into the surgically bruised trigone.

SHOCK

Shock is now rarely seen since surgeons have learned the usefulness of transfusions during prolonged operative procedures and since the newer methods of anesthesia have come into general use. These methods have been brought into use by specialists in anesthesia who also have become experts

in judging the altered physiology of the patient subjected to the combination of surgical procedure and anesthesia. With the lessening of operative shock through gentle handling of tissues by the surgeon and with the maintenance of blood pressure, body temperature and fluid balance by the anesthetist during the operation, postoperative anuria is less frequently seen.

Shock must be treated at once with every means available—external heat, lowering the head of the patient, transfusions of blood or plasma, as well as adequate amounts of fluid and injections of desoxycorticosterone acetate. Shock is one of the most frequent causes of postoperative failure in kidney function. Many days of seriously damaged kidney function may follow a few hours of shock.

POSTOPERATIVE ANURIA

After operation, a continuing pronounced reduction in the urinary output or postoperative anuria accompanied by a rising non-protein nitrogen level are danger signals of extreme importance. Each case demands careful individual analysis. The condition of the urinary tract must be known. Fluids should not be forced in event of anuria. It is difficult, but often an expression of mature wisdom, to avoid extensive therapeutic measures in patients with anuria. Their own metabolic products rapidly accumulating are the best diuretics of all and will do more to establish renal function, if the blood pressure is kept at a proper level, than any artificially administered renal stimulant.

For the patient's comfort, acidosis and alkalosis should be prevented in anuria through the intravenous use of the buffer sodium lactate solution. The following formula is used to determine the number of cubic centimeters of the molar sodium lactate solution to be used: 60, minus the carbon dioxide combining power, times three-tenths of the body weight in kilograms, with the result multiplied by six. The patient feels better if the acid-alkali ratio is kept in chemical balance. It is not known if the speed of recovery from anuria is helped by this means. However, since it is certain that in anuria, edema depresses all body functions and is liable to interfere with the return of the kidney function to normal, the fluid intake must carefully be kept below the edema level.

In particular, the urinary tract must be demonstrated to be free of obstruction. This is especially important if the sulfonamides have been used, because of their tendency to produce crystalline deposits in the urinary tract which tend to mass and block the ureters. If the anuria is caused by surgical obstruction of the urinary tract, the site of the lesion will be located by a cystoscopic study. This study should be carried out as soon as the attending physician is sure that anuria exists.

To acquire a knowledge of the patency of the ureters, ureteral catheterization must be done. Gentle cystoscopic examination with the passage to the renal pelvis of very small ureteral catheters will not harm the patient and will demonstrate that the passage from the kidneys is not blocked.

Report of a case illustrating a type of obstructive anuria follows:

CASE REPORT

CASE 1: A young female patient in a hospital had not voided urine for three days. She had a fever of 104° F.; pulse rate of 120, and malaise, but no localized pain and the bladder was empty. Three days previously, during labor, under the observation of an experienced obstetrician, the patient had suddenly gone into shock. The obstetrician realized that the uterus had ruptured and had the patient prepared for abdominal section while giving a transfusion. He called a surgeon and together they opened the abdomen, removed the living baby from the peritoneal cavity and performed a hysterectomy. The anesthetist maintained a continuous transfusion and the patient left the operating room in good condition, but for three days there had been no urine passed.

Although the patient's general condition was good, attending physicians felt that the anuria was a result of operative shock, perhaps added to by the transfusion. Because there was no localized kidney pain they had not seriously considered a dynamic obstruction until the temperature became elevated. Then they sought consultation.

In a cystoscopic study, both ureters were found solidly blocked at a point 3 centimeters above the trigone. The abdomen was then reopened, the ureters were isolated and followed downward to the stump of the cervix. They were found to be cut off and to have been sewed into the cervical stump with the round ligaments. It was not difficult to disengage them and to re-implant each ureter into the bladder just above its normal site in the horn of the trigone. The dilatation of the ureters usual in pregnancy had lengthened them, and the lengthening process had been augmented by three days of ureteral obstruction. Hence, although shortened by the previous operation, they were easily reimplanted near their normal site. Their widened diameter also made it easy to leave a No. 11 French ureteral catheter inlying in each ureter to the renal pelvis. The catheters were then passed down through the urethra to act as splints protecting the ureterovesicalneostomy. A flood of urine was released during the operation, and the flow continued thereafter. There was little postoperative reaction, and the non-protein nitrogen level fell postoperatively from 150 mg. per 100 cc. to normal in two days.

On the eleventh day, the No. 00 chromic sutures stitched in the bladder wall to hold the ureteral catheters in place had absorbed and the catheters slid out of the bladder. The patient voided normally from that day on.

Dilatation of the ureterovesical orifices has never been necessary. The patient has continued well for ten years since this surgical experience. Pyelography recently revealed what appeared to be a normal upper urinary tract. Kidney function tests showed normal readings.

The placing of ureteral catheters as a precautionary measure prior to gynecological operations, thus making the ureters readily palpable, would be an added protection against ureteral injuries during pelvic operations. Gynecologists in general feel that this is an unnecessary precaution since they are confident in their ability to know just where the ureter lies without this aid, yet occasionally even an able and seasoned surgeon, thoroughly familiar with pelvic anatomy, may ligate or sever a ureter in the course of a comparatively simple gynecologic operation.

The author has observed a considerable number of such accidents. Ligation of both ureters has been

observed in five patients. In one of these patients both ureters were completely ligated. In another, both ureters were completely ligated and cut away from their attachment to the bladder. Two of the patients in this group had one ureter partially constricted by a ligature, and the other completely constricted. One had both ureters partially constricted. Eight patients have been observed in whom the left ureter only was ligated; three in whom the left ureter was cut by a suture, followed during the immediate postoperative period by extravasation of urine. In one of the latter three, the extravasating urine made its way through the abdominal wound onto the abdomen as well as into the vagina, while in the other two the urine found its way only into the vaginal vault. In one of these latter the right kidney was found to have a preexisting ureteropelvic juncture obstruction due to a congenital aberrant blood vessel which crossed the ureter at this point of juncture with the renal pelvis. This opposite kidney was almost functionless and the patient was depending for kidney function on the left side in which the ureter had been cut by a stitch and partially ligated. By the time the patient was seen by the author, a large hydro-ureter and hydronephrosis had developed on the left side and kidney function was rapidly deteriorating. Function of both kidneys was restored by reimplantation of the left ureter into the bladder and repair of the right hydronephrosis.

In one case the left ureter was completely severed by a surgeon who, recognizing the lesion, sought assistance. A satisfactory end-to-end anastomosis of the ureter was done and there has been no subsequent hydronephrosis or pain.

Torn urethral sphincters following panhysterectomy have been observed in two patients, and urethrovaginal fistula in one. One patient with vesic sigmoidal fistula and one with vesicovaginal-rectal fistula following panhysterectomy have been observed, as well as ten with vesicovaginal fistulas following this procedure.

In most of the cases listed in the preceding paragraph, the lesion was satisfactorily repaired. Several of the patients in whom a ligated ureter has been opened and widened through ureteral dilatation have to be subjected regularly to ureteral dilatation in order to keep the ureter sufficiently wide. If ureteral dilatation is neglected, pain in the kidney and increasing hydronephrosis and hydro-ureter follow.

In recent times, however, the author has had 100 per cent success with the closure of vesicovaginal fistulas due to a recent improvement in surgical technique which, incidentally, greatly simplifies the surgical procedure of closure.¹

CASE REPORT

CASE 2: In one of the three previously mentioned cases in which there was extensive urinary extravasation after a suture had passed through the wall of a ureter, the husband of the patient insisted that the kidney must not be removed, although intravenous pyelograms had revealed much dilatation of the left ureter and left renal pelvis down to the point where the ureter had been transfixed and cut by the suture. The husband's terms were accepted and the

operation was undertaken. Exploration revealed the point of ligation of the ureter 8 centimeters above the ureterovesical juncture, well above the vault of the bladder. The ureter, above the point of ligation, was widely dilated. At first it seemed impossible to reimplant this ureter in the posterior wall of the bladder because of its shortness.

As an alternative proposal, a uterocutaneous neostomy was being considered. A No. 18 French Robinson urethral catheter was passed upward through the ureter into the renal pelvis. While this much-dilated ureter was being palpated against the firm Robinson catheter, it occurred to the author that if a spiral incision were made around the ureter and the ureter then pulled downward, it would be greatly elongated as the diameter of its channel was reduced. It was not difficult to make such a spiral incision against the firm Robinson urethral catheter. The incision was carried spirally around the ureter almost to the renal pelvis. The No. 18 Robinson catheter was then withdrawn and replaced by a No. 10 Robinson catheter and the lower end of the ureter was pulled downward easily reaching a point one and one-half centimeters above the left ureteral orifice. Here it was implanted into the bladder wall, the No. 10 Robinson catheter within it having been carried through the wall of the bladder and passed to the outside through the urethra. Interrupted No. 00000 chromic stitches held together the cut edges of the ureter which ran spirally around the Robinson catheter. These stitches were placed infrequently along the course of the spiral incision in the ureter. Drainage through the Robinson catheter was perfect. There was no urinary extravasation and on the tenth post-operative day the Robinson catheter was withdrawn, leaving a perfectly functioning ureter. The hydronephrosis present in this kidney at the time of operation subsided considerably. At present, seven years after operation, the left kidney is functioning perfectly without pain. It is not hydro-nephrotic. The ureter is scarcely larger than normal in calibre. A cystogram reveals no reflux up the left side.

The ureter is probably more often ligated than cut in the course of general surgical procedures in which it is unexpectedly involved. It may be clamped, cut with a scalpel or scissors, transfixed

by suture, stripped of its adventitia so closely that leakage later develops, or actually cut in two. Such cases are probably not all reported. Indeed, such a lesion in the ureter is often not discovered. When a severed ureter is discovered some surgeons advocate ligation of the proximal end of the severed ureter. Such a complete obstruction is often followed by the quiet development of hydronephrosis in the kidney which the ureter normally would drain. This obstruction through ligation of one ureter may even pass unnoticed throughout the postoperative course. However, if the kidney on the opposite side were deficient, grave results would follow. Leakage of urine due to a cut in the wall of the ureter may stop spontaneously in about ten days to two weeks. This period of drainage of urine could be shortened by the placing of an in-dwelling ureteral catheter in cases in which it is possible to catheterize the incised ureter.

Once urinary extravasation has taken place and an outlet for the urine has been established, it is best to withhold surgical intervention until tissue reaction has ceased and all the surrounding tissues have become firmly healed. A reparative operation may then be undertaken. However, if nephrectomy has been selected as the procedure of choice, it may be done at once, as soon as the function of the opposite kidney has been demonstrated to be adequate. Experience has shown that the natural tendency of the body to assist in the repair of such a lesion is so great that a patient may be given assurance that normal function will be restored.

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REFERENCE

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